

DESCRIPTION

The machine can sort documents into three separate arrival pockets. Documents with a certain digit or combination of digits are stacked selectively into two pockets and rejected documents are fed to the third pocket.

Since the document is handled on one side only by rotating vacuum capstans and its passage is uninterrupted by mechanical gates, even the thinnest documents will not be damaged in any way.

Additionally, documents which have carbon or a similar sensitive coating on one surface can be processed without any difficulty. The feeder may be stopped between any two documents under electronic control. On arrival at a pocket the document operates a photo-electric cell which checks that the document has reached the correct pocket. Failure of the document to reach the correct pocket automatically stops the machine and operates a warning light.

SPECIFICATION OF 3-POCKET DOCUMENT READER

	Summary
Speed	1,200 documents per minute.
Document Range	2.63" × 4" to 4.2" × 6.7" (67 mm. × 102 mm. to 107 mm. × 170 mm.). Thickness .002"-.005" (.05 mm. to .125 mm.). In certain circumstances documents 9" (230 mm.) long can be accommodated.
Document Coding	CMC-7 with alpha if required, or E-13B, and/or optical mark sensing.
Input	8.5" (21.5 cm.) capacity continuous feed.
Output	Two pockets plus reject pocket, each of 6 in. (15 cm.) capacity.
Size	4' 4" × 2' 4" × 3' 6" high. (1.3 m. × 0.7 m. × 1.06 m.).
Weight	600 lb. (270 kg.).
Power Supply	Single phase 50 or 60 C/s. 2 kVA.

CAPABILITY

Used or new paper can be handled over a very wide range of thicknesses which includes postal orders, bank-notes, and cheques.

Documents must be of uniform size which may be in the range of 2.63 in. (67 mm.) to 4.2 in. (107 mm.) in width and 4 in. (102 mm.) to 6.7 in. (170 mm.), in length. Data to be read should normally be referenced to the lower edge of the document.

PAPER TRANSPORT

The documents are separated before they are fed by a combination of air and vacuum techniques. Since the vacuum forces used are very large compared with frictional forces and the weight of the document, a very positive and effective separation and transport system is possible. The use of vacuum handling enables the document to be handled on one face only at a time and to be drawn through the system by pulling at the leading edge, rather than by pushing or by friction. Because of this the paper handling is so gentle that the document may be fed some 500 times through the machine without significant damage, even at the high speed used, namely 200 in./second (5 m./sec.).

The machine has been designed to be extremely tolerant of paper condition so that documents which have received considerable handling, and which may be printed on cheap thin paper if desired, can be fed through the machine at high speed without risk of jamming the machine or damaging the document.

DOCUMENT SPECIFICATION

Creases, dog-ears, Sellotape, adhesive stamps, staples and even paper clips on the documents will not impair the performance of the machine although if they affect the code line they may of course cause rejects. Holes in the document are acceptable provided these are reasonable in extent and number.

The machine will accept a range of document sizes, but in general for the best performance these should not be intermixed in the same pass.

The normal position for the code line is 0.18 in. (4.8 mm.) from the lower edge of the document, but since during reading the document is held on the reverse face only, provision can be made for code lines in other positions, multiple code lines, and code lines varying in position on different passes.

The documents can be cancelled as they pass through the machine with an ink stripe from end to end and if required a detector can be fitted so that documents cannot pass twice through the machine.

MECHANICAL DESIGN

The mechanical design is such that the machine will have a long trouble-free life. There are no reciprocating parts and only seven constant speed rotating members in the feed and transport system.

All operations in the machine are synchronised by toothed belts so that the feed rate is constant and independent of document size. Because of its mechanical simplicity and small number of moving parts the machine runs quietly at high speed.

Because each document is well separated from all the others by vacuum forces before any attempt is made to feed it, a double feed is very unlikely to occur. However, the following measures are incorporated to prevent two documents passing without detection.

1. An overlap detector is used to ensure that two documents cannot pass together unless they are exactly in register. (Detects document too long.)
2. For the case of two documents in register an accurate electro-mechanical caliper is used to check for a double thickness in the document as it passes through the transport mechanism. If a double thickness is detected the machine will automatically stop.
3. Two overlapped documents will cause a reject in the CMC-7 reader self-checking circuit, if both documents are magnetically coded.
4. Since the feeder feeds on to a rotating vacuum drum it is unlikely (because the document is thrown outwards by centrifugal force) that the outer document will pass with the inner document under the reading head. Friction at the head will also impede this, unless the two are strongly stuck together at the leading edge.

VACUUM SUPPLY

If an absolute minimum of noise level is required at the operating position it is recommended that the vacuum and air pumps supplying the machines should be placed away from them in a more suitable location. This has the added advantage that if several reader units are in use a single pump installation can be provided to supply all the reader units.

READING SYSTEM

The reading system is designed to read magnetic ink characters spaced 8 per inch in the document code line. At the standard paper speed of 200 in./sec. (5 m./sec.) the character output rate is 1,600 per second.

CMC-7

The standard machine is designed to read CMC-7 numerals and symbols printed with magnetic ink. Provision can be made for reading alphabetic CMC-7 characters if required. The CMC-7 code has been chosen because due to its digital nature and self-checking features it gives the lowest reject rate, and by far the lowest misread rate, of all the available magnetic and optical character codes. (Typical reject rate less than 1 in 10,000; misread rate less than 1 in 10,000,000.) Because of its basic simplicity CMC-7 also gives the lowest reader cost.

Seven magnetic bars must be found by the reader in every character, otherwise a reject is signalled. These bars 0.15 mm. wide are separated by gaps either 0.15 mm. or 0.35 mm. wide. The characters are coded by allowing the wide gaps to vary in position within the character. The wide gap is narrower than the gap which occurs if a bar is completely absent (.45 mm.). Therefore even in the extreme case of bars missing coinciding with stray ink splashes, it is almost impossible for one valid code to be transformed into another accidentally.

E-13B

As an alternative, a reader for the E-13B magnetic font can be supplied.

READER OUTPUTS

The character output of the reader consists of a set of lines, one for each character to be recognised. A pulse appears on the appropriate line each time a character is correctly identified. A pulse appears on a further reject line if the character cannot be reliably identified. An output in this form is readily transformed into any desired binary code. (The standard output pulses are 6 volt, negative going, rise time $\angle 1 \mu\text{sec.}$, duration $10 \mu\text{sec.}$) Outputs on further lines are provided to indicate each character in the code line, the inter character spaces, the inter-field spaces, and the document leading and trailing edges.

MARK SENSING

A reading system for optical mark sensing can also be supplied suitable for 6 or 8 per inch. The marks can be strokes, bars, or crosses made using ordinary pencil, pen, or ball-point pen. Alternatively where the writing instrument is under the control of the machine user, fluorescent inks or pencils can be used to advantage to give a very low reject rate. A clock track must be printed on the document to give timing information.

MACHINE OPERATION

1. Internal Control:

A selection matrix with movable pins is used to select the sorting field on the document, the number of digits in each field, the start and stop symbols if any, and the character or character combination on which it is desired to sort. For example an 'ON-US'/'NOT ON-US' sort can be carried out, or a complete account number can be set on a pocket and all documents bearing this number can be extracted as a by-product of the reading process.

Alternatively the pockets can be under batch control where a batch or control slip carrying a special code is placed ahead of each batch of documents in the feeder.

Successive batches can then be automatically routed alternatively to the two accept pockets.

Electro-magnetic counters are provided to indicate the number of documents which have left the feeder, and the number which have arrived at each pocket. A 'total arrival' counter is also provided.

Photo-electric arrival detectors check the safe arrival of each document, if a document does not arrive, or if it arrives when not expected, the fault condition is indicated on coloured indicator lights, and the feed is automatically stopped within 50 m/secs.

2. External Control:

The document reader can be connected to a variety of other machines. For example it may be linked to a high-speed printer producing a list of all documents passing through the reader, with totals as required, or to a slow lister producing totals only, or to magnetic tape decks to permanently record the read information for subsequent processing by a digital computer.

The document reader can also be linked to a digital computer directly or via a data transmission link. The linked machines can if necessary control start and stop feed, and the routing of documents to the output pockets of the reader.



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